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Connecticut Agricultural Experiment Station

New Haven, Connecticut

REPORT OF THE DIRECTOR

FOR THE

YEAR ENDING OCTOBER 31, 1925

The Bulletins of this Station are mailed free to citizens of Connecticut who apply for them, and to other applicants as far as the editions permit.

CONNECTICUT AGRICULTURAL EXPERIMENT STATION

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as of

October, 1925

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Tobacco Sub-station at Windsor.	PAUL J. ANDERSON, PH.D., <i>Pathologist in Charge.</i> N. T. NELSON, PH.D., <i>Assistant Physiologist.</i>

REPORT OF THE DIRECTOR

FOR THE YEAR ENDING OCTOBER 31, 1925

To the Board of Control of the Connecticut Agricultural Experiment Station:

In accordance with the custom established some years ago, I have the honor to submit a review of the Station activities for the past year, and in addition a complete list of publications, the changes in staff and similar matters of general interest.

REVIEW OF THE YEAR

THE FIFTIETH ANNIVERSARY

The American agricultural station is now recognized by all as an essential agency of the state, but its establishment in Connecticut fifty years ago came only as the result of years of patient effort on the part of a few men. For twenty years, Professor Samuel W. Johnson urged the need of research in agriculture and in 1875 the General Assembly made the first appropriation. It was very fitting that the state and nation take note of the semi-centennial of this event.

On representation to the General Assembly, a small special appropriation was granted which made possible the arrangement of a suitable program. The celebration took place on the station grounds on Monday, October twelfth, and was attended by many prominent citizens of the state, directors of other experiment stations and representatives of the United States Department of Agriculture, the Association of Land Grant Colleges, Yale University, Connecticut Agricultural College and Wesleyan University. His Excellency, John H. Trumbull, Governor of Connecticut, presided and gave a brief address. Other addresses were given by Dr. E. W. Allen, Chief of the Office of Experiment Stations, United States Department of Agriculture, and Dr. R. W. Thatcher, Director of the New York Experiment Stations. As a part of the program a fine portrait of Dr. E. H. Jenkins was presented to the Station by Dean Henry S. Graves, Provost of Yale University, as a gift from Dr. Jenkins' many friends and admirers.

The wide recognition of the event and the esteem in which the station is held were also evidenced by the handsome parchment testimonials received from the Rothamsted Experimental Station, England, the Sheffield Scientific School of Yale University, and the Connecticut Agricultural College. In view of the general interest, there is now in preparation a bulletin which will include

a complete account of the proceedings, together with a history of the station and its work.

"DEFENSE" (CONTROL) WORK

INSPECTION OF FERTILIZERS, FEEDS, FOODS, DRUGS, ETC.

In accordance with statutes assigning such duties to the Station, the Department of Chemistry has analyzed 830 samples of fertilizers, 352 of feeding stuffs, 1800 of foods and drugs, besides making many miscellaneous determinations. By making a special



FIG. 28.—A Group of Guests at the Semicentennial.

effort, the Report on Fertilizer Inspection was completed and published early in the winter, thus placing information in the hands of farmers before the buying season.

In addition to the above the Chemistry Department calibrated 6000 pieces of Babcock glassware, examined Insecticides and Fungicides offered for sale in the State, made special studies of Diabetic Foods and of prescriptions dispensed by physicians, all of which are statutory duties.

THE NEW FEEDING STUFFS LAW

The last General Assembly amended the statute regarding "Commercial Feeding Stuff," making the application broader and requiring registration of all brands. This went into effect July 1, 1925, and will increase the volume of the Station's work.

INSPECTION OF ORCHARDS AND NURSERIES

The new law passed by the General Assembly of 1925 requires that all nurseries register with the State Entomologist (who is also the Station Entomologist). This adds to the details of inspection but makes the law much more effective. About 150 nurseries are listed. A total of 2,977,346 imported plants were inspected and reported to the Federal Horticultural Board. Many orchards and gardens have also been examined on request.

A new service to fruit growers, as a basis for their spraying plans, was a special survey of orchard pests maintained during the



FIG. 20.—Fighting the Gipsy Moth. The can contains parasites that attack Gipsy Moth Eggs.

spring and early summer. This information was disseminated at timely periods through coöperation with the Extension Service of the Agricultural College and was made possible by the addition to the staff of another botanist, who has also assisted in the inspection of nurseries and orchards, thus covering the plant diseases more thoroughly than has been possible heretofore.

THE GIPSY MOTH

There has been no serious spread of this pest and all in touch with the situation are encouraged. Our entomologists, in coöperation with the Federal workers, have scouted 108 towns, creosoted

20,921 egg clusters, sprayed 276 colonies and scouted 8,399 miles of roadway. Parasites of several species have been released and the prospect for this method of control is good.

THE EUROPEAN CORN BORER

Through coöperation with the U. S. Department of Agriculture, part of the shore has been scouted. Five infestations were discovered and the burning of plants that harbor the larvae will be undertaken this winter. So far there is no cause for alarm but all citizens along the shore are urged to report suspected outbreaks.

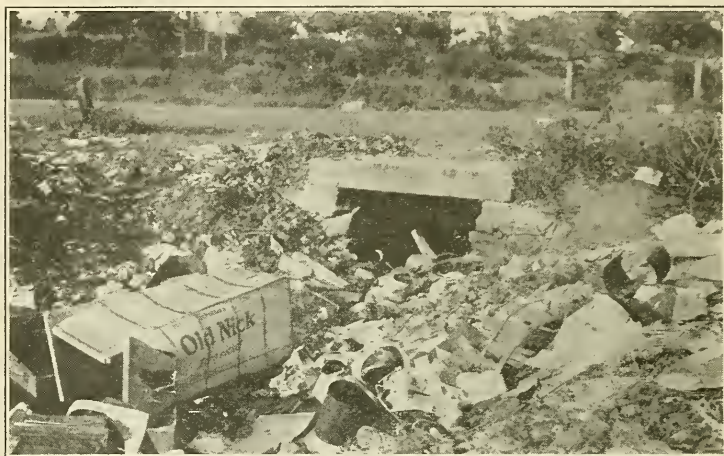


FIG. 30.—A "Mosquito" Problem. This ditch leads from a marsh and has been used as a public dump.

THE MOSQUITO NUISANCE

The summer of 1925 proved one of the worst in years. Owing to the lack of state funds, the ditches in some cases are in charge of the towns and cities. A series of dry years relaxes the local interest, new real estate developments affect the drainage, ditches are used for public dumps and when a wet season comes, the mosquitoes become a very real pest. In so far as the State appropriation allows, the areas in charge of the Station have been kept in good condition, but adjacent areas uncared for or undrained will furnish an ample supply of mosquitoes, for they will fly several miles. In West Haven the town authorities became very active about the middle of the season and 1926 should see much improvement. Fairfield, Greenwich and Stamford are also active.

State funds are insufficient for new work. The only new area drained was part of Westbrook where \$1,100 was voted by

the town and considerable ditching done. Clinton has voted \$10,000 to be spent in 1926 and East Haven is about to undertake an elaborate program.

Under the new statute, contributions by the towns are voluntary, so that in spite of a small increase in the state appropriation, the funds available for maintenance are actually reduced. Unless towns, cities, boroughs and individuals take an active interest and raise funds, we may expect to find our shore communities and resorts very uncomfortable.



FIG. 31.—Lawn in Westville (New Haven) injured by the Asiatic Beetle.

THE ASIATIC BEETLE

This new pest of lawns has spread over a considerable area in Westville (New Haven). Local eradication is no longer effective. As a result of a careful survey, the entomologist has undertaken a campaign for complete eradication. This will require coöperation of the State, the U. S. Department of Agriculture, the City and some 700 householders. If funds (\$25,000) are raised, work will begin this spring and it is hoped to stamp out the infestation by fall.

CONTROL OF WHITE PINE BLISTER RUST

The statute charges the Station with the work of control and eradication of this disease, the U. S. Department of Agriculture coöperating. During the past year a large crew operated in

Canaan, Salisbury and North Canaan, removing gooseberries and currants which spread the disease. For the entire state 15,691 acres were cleaned and scouting done in 15 towns.

PROGRESS OF INVESTIGATIONS

THE VEGETABLE PROTEINS

Recent observations of *unusually rapid growth* in several groups of rats on special diets have led to consideration of the so-called "curve of normal growth." Whereas we have considered 65 to 70 days the normal period for growth from 60 to 200 grams, animals on certain rations have recently made the same gains in 38 days. This may be due to any one of several causes. So far we have been unable to account for it to our own satisfaction.

Results of work in collaboration with Dr. Mason of Yale University indicate the existence of a "*fertility factor*," in the absence of which degenerative changes procede in the testes, and fertility becomes impaired despite excellent somatic growth. Dr. Mason states in his report to the National Academy of Science (Apr. 1925)—"Addition of lettuce to the basic ration prevented the testicular degeneration which would otherwise occur. The effect of the lettuce is due to its richness in the anti-sterility vitamine E. The presence of this vitamine seems absolutely necessary for normal reproductive function and germ cell maturation."

By applying his ether method to the leaves of spinach, Dr. Chibnall has prepared a new protein "*spinacin*" from the cytoplasm. A protein of similar properties was also obtained from the leaves of maize.

Our experience with the problems presented by the *analysis of juice of the alfalfa plant* has shown the necessity for much further study before any adequate picture may be formed of the chemical reactions of the metabolism of the plant. Much attention is now being given to this problem.

BREEDING BETTER CORN AND VEGETABLES

"*Crossed Corn*" continues to give superior results wherever tested. On field corn special effort is now being directed to perfecting a simple method of producing crossed seed of such strains on a large scale, thus removing the objection raised by farmers.

Two new varieties of *sweet corn* have been produced by this new method of corn breeding which consists of crossing two uniform and fixed inbreds and utilizing only the first generation hybrid. "*Crossed Crosby*" is an early white corn of the Crosby type, having 12 to 16 rows and ripening about one week earlier than Golden Bantam. "*Red-Leaved White Evergreen*," mentioned in the

report last year, is a pure white corn of the very best quality, medium in size, prolific and ripens in mid season. The leaves and husks are light reddish which makes the corn easily recognized on the market. Seed of these hybrids is now available in small quantities for testing and may be obtained by writing the Station.

The same method used heretofore is now being applied to "*Whipple's Early Yellow*" sweet corn, the aim being to improve the quality and give it the uniformity in size, shape and ripening that is characteristic of all "Crossed Corn."

Improvement of *vegetables* is now under way on an intensive plan. Cross fertilized crops like asparagus, beets, carrots, cab-



FIG. 32.—"Red leaved" Evergreen Sweet Corn.

bage, onions, rutabagas and squash, are being subjected to breeding and selection, following the same general method so successful with corn. For the self-fertilized vegetables selection methods are being applied, those receiving principal attention being beans, lettuce and tomatoes.

At the Station farm at Mt. Carmel where this work is carried on the plant breeder is also testing such new strains of vegetables as the Yellow-resistant Savoy Spinach originated by the Norfolk (Va.) Truck Station, a pod spot-resistant bean from the Cornell Station, the Vermont Hubbard Squash, Penn State Earliana Tomato and Penn State Ball Head Cabbage from the Pennsylvania Station, along with the varieties now standard in this region.

PLANT DISEASES

Celery blight causes heavy losses to market gardeners but few are equipped to spray. Dust is more easily applied but the results for this season are no more encouraging than last. Dust gives some control but Bordeaux spray is much more effective.



FIG. 33.—Spraying Celery on Experimental Plots.

As a result of several years careful work it has been shown that "Black Root Rot" of tobacco is caused by *Thielaviopsis basicola*, a fungus distinct from *Thielavia basicola*, which was formerly supposed to be the asco stage.

The study of *mosaic* has now been in progress twenty-two years. Perhaps no other plant disease has attracted so wide attention in

recent years, many botanists having taken up this perplexing problem. At this Station we are encouraged by recent discoveries which will throw further light on the nature of the disease. A bulletin is now in preparation.

Apple and Peach Diseases continue to occupy much attention. The trials of new dusts and sprays, combinations of both and methods of application, were continued in the Station orchards at Mt. Carmel farm and at the farms of Mr. Platt at Milford.



FIG. 34.—Young Pine Plantation in Brush Land.

THE INFLUENCE OF SOIL ON THE FOREST

This is practically a virgin field upon which the station foresters began work two years ago. Very little work has been done in this country or abroad, partly due to the lack of knowledge of the soils in forested regions. In Connecticut fully two-thirds of the land area is best suited to forestry, at least under present economic conditions. If the soil is a factor to be reckoned with in planting and managing forests and wood lots, then it is essential that we know the part it plays. To discover the facts a detailed study is now under way in close coöperation with the Soils Department. On each of our important soil types several timbered plots have been laid out. Careful measurements are made of the species, growth and stand as well as of the factors of soil water, reaction, and nutrients present. Out of this we hope to establish the effect, if any, of soil on our native and introduced trees and the adaptation of these latter to our conditions.

AN INVENTORY OF OUR FOREST PLANTATIONS

There is a dearth of collected information for our many citizens who wish to make forest plantings. For many years our advice on plantings has been based largely on European experience. There are now many plantations in the state over twenty years of age. To bring together this mass of individual experience a careful survey is now being made.



FIG. 35.—Injury to spinach caused by the Spinach leaf miner.

INSECT PROBLEMS

The *Plum Curculio* on Apple is receiving careful study. As a control there was introduced into the spray, lead arsenate coated with lead stearate and fish oil sticker. Marked decrease has been noted in the number of curculios this year, but this may be due to previous treatments or other conditions.

Foul Brood of Bees, on which work was begun in 1924, seems to yield to treatment with Hutzelman's alcohol-formalin solution. Other solutions of formalin were tried with encouraging results.

The Chemical Changes in Spray Mixtures present an important and interesting problem. It has been found that the amount of sulfur in solution directly affects the solubility of arsenic in lime-sulfur, lead arsenate, nicotine and casein mixtures.

The Oriental Peach Moth has apparently spread over all the state and more damage resulted in 1925 than 1924, being found also in quinces. Some orchards reported over 50 percent of the peaches wormy. So far no real control has been found although some reduction of injury was obtained by spraying in June with nicotine to kill the eggs and dusting later with lead arsenate-sulfur dust. Many other treatments are being tried. Bait pans containing molasses and yeast caught large numbers of moths and this may offer some relief.

An investigation was begun on the control of the *Spinach Leaf Miner* and this will be actively followed next year.

SPRAYING VS. DUSTING

Spraying vs. dusting experiments were continued in 1925 as before except to discontinue the use of copper dust and to add some promising combinations of spray and dust. The season of 1925 was unfavorable for the development of fungous diseases and as insects are usually well controlled by dusting, *all* the treatments gave quite good results. Spraying ranked first, a combination of spray for the first three treatments and dust for the last three was second, sulphur dust third, with other schedules ranking still further down the scale.

CONNECTICUT SOILS AND THEIR RESPONSE TO FERTILIZERS

Soils from twenty-four areas representing the most important soil types of the state are being studied exhaustively in the greenhouse and laboratory, with a view to determining how and why they differ in productive capacity and economic value. Chemical studies of nearly one hundred samples of soil show the following:

POUNDS PER ACRE IN SURFACE SOIL.

	Nitrogen	Phosphorus	Potassium*	Limestone requirement, Tons per A.	pH
Average	4,178	1,760	30,220	2.78	5.43
Highest	9,850	4,080	45,100	0	7.0
Lowest	826	502	17,800	7.57	4.1

* 12 soils only.

An example of what these results may mean is shown with soil No. I, preliminary pot studies upon which were begun in 1925.

The analyses showed 3,550 lbs. nitrogen, 1,238 lbs. phosphorus and 43,000 lbs. potassium per acre in the surface soil, with a limestone requirement of three tons per acre, and a high active acidity, 4.9 pH. The total phosphorus content was considerably below the average, and chemical tests showed this phosphorus to be in a very unavailable state. The illustration indicates the response of alfalfa when phosphorus and lime were applied to this soil.



FIG. 36.—The effect of several treatments on Soil No. 1 as shown by the growth of Alfalfa. K = Potash, P = Phosphoric Acid, L = Lime.

THE TOBACCO STATION AT WINDSOR

On March first, 1925, Dr. Paul J. Anderson took charge of the Tobacco Substation, since which time the program has gone forward in a very satisfactory manner.

Several special problems arose during the year, notably a severe outbreak of *wire worms*. The staff at Windsor with the entomologists at New Haven spent considerable time in testing various treatments and secured fair results from the use of calcium cyanide drilled in. If there is another outbreak in 1926, this will be tested further.

It has been known for a long time that *Black Root rot* injury might be increased by making the soil too alkaline, but there was no accurate data on just how acid a soil must be kept to be safe.

Studies carried on in the past season indicate that a soil may test as high as 5.9 pH without danger.

The soil conditions on the *Brown Root Rot* series not being satisfactory, a new series of plots was laid out last spring on the farm of Mr. Conner at Poquonock. No conclusions can be drawn for several years but the season of 1925 was very encouraging. Mr. Murwin of the U. S. Department of Agriculture had immediate charge of this project.

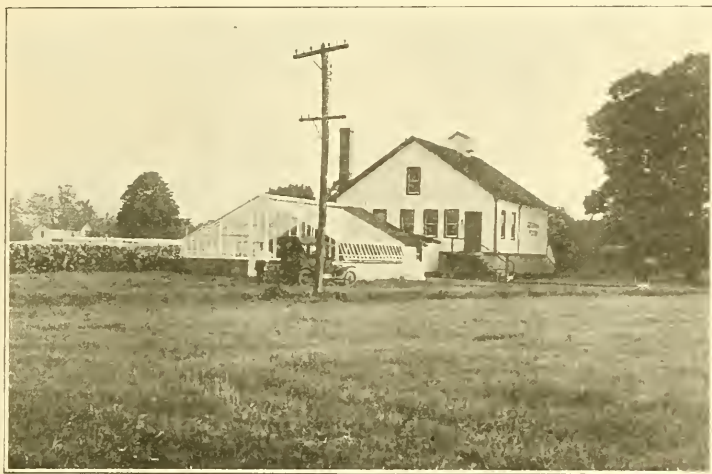


FIG. 37.—The Tobacco Station at Windsor—showing laboratory and greenhouse.

As usual, much time was spent in direct *service* to growers, who, in increasing numbers, bring their problems to the Tobacco Station or request visits. Dr. Anderson has also spoken at a number of meetings.

Four hundred growers attended the Tobacco Field Day, held at the farm on July 28. The visitors were conducted over the plots and the work explained. Following lunch a very interesting program was held.

MT. CARMEL FARM FIELD DAY

In view of the fact that an exhibit was to be sent to the Charter Oak Fair and the Semi-centennial celebrated in October, the Board voted to omit the usual field day at the Station Farm at Mt. Carmel. It is planned to arrange a special program next year in conjunction with the Farm Bureau.

CHANGES IN THE STATION STAFF

Appointments:

George D. Scarseth, B.S., Graduate Assistant in Soils, February, 1925.
Paul J. Anderson, Ph.D., In charge Tobacco Station at Windsor, March, 1925.

George E. Graham, Superintendent of Buildings and Grounds, June, 1925.

A. D. McDonnell, General Assistant in Botany, June, 1925.

Resignations:

A. E. Moss, M.F., Assistant Forester, June, 1925.

William Veitch, Superintendent of Buildings and Grounds, June, 1925.

G. E. Graham, Assistant in Botany, June, 1925.

PHYSICAL EQUIPMENT

As is customary, major repairs and additions to equipment are made toward the end of the fiscal biennium. This period ended June 30, 1925, and during the spring and summer the station buildings were painted, walks repaired and the entire plant put into good condition.

The General Assembly of 1925 provided \$5,000 for the erection of a new section of the greenhouse on the station grounds. This takes the place of the house torn down in 1918 to make room for the proposed Board of Health laboratory. The new house is now under construction, is 22 by 85 feet and will make space for considerable expansion of the work in plant breeding and soils.

At the Tobacco Station at Windsor, a "Carrier Apparatus" for controlling temperature and humidity was installed in the curing chambers, thus making possible normal curing of small lots of tobacco, an impossibility in the sheds. This single piece of equipment cost \$3,500 but much of our work was at a standstill without it. A small greenhouse was also erected at the Tobacco Station.

About 900 volumes were added to the library, which now includes 16,200 volumes and a very complete equipment of scientific journals. The station received from Dr. T. B. Osborne a very valuable gift of rare chemical journals totaling 3,500 volumes.

The inventory of June 20, 1925, shows:

Value of land and buildings	\$304,550.00
Value of contents	120,884.80
	<hr/>
	\$425,434.80

WHAT THE STATION CAN DO

Each mail brings to the station requests for information and service, the range of subjects being almost without limit. Every effort is made to comply with these requests, even though they are

outside the fields under investigation. This is one of the purposes for which the library is maintained. However, some of the letters request help that requires an intimate knowledge of live stock management and the like and again we are asked to make laboratory determinations for which we do not have the equipment or staff. Therefore it is helpful to publish from time to time a list of the subjects on which we can furnish information and the kinds of samples we can accept.

The Station can furnish information on:

- Fertilizers and fertilization.
- Soils and their management.
- The chemical composition of Foods, Drugs, Insecticides and Fungicides.
- The composition of Diabetic Foods.
- Insect Pests of plants and their control.
- Fungus and other Diseases of plants and their control.
- Sprays and spraying.
- Fruits and fruit management.
- Weeds and their control.
- Forestry—all phases.
- Care of Shade Trees.
- Plant breeding—especially field and sweet corn.
- Lawns, establishment and care.
- Bees.
- Mosquito Elimination.
- Tobacco culture.

Samples and specimens that can be analyzed, tested or identified:

- Fertilizers.
- Feeding stuffs.
- Foods and Drugs.
- Milk—except for bacterial content.
- Seeds.
- Weeds and other plants.
- Insects.
- Diseased and injured plants.
- Soils.

The Station cannot furnish information on:

- Live stock feeding and management, including Poultry.
- Animal diseases.
- Household management.
- Clothing.
- Farm management.
- Marketing and coöperation.

Requests for information on these subjects should be sent to the Connecticut Agricultural College at Storrs.

The Station cannot make analyses and examinations of:

- Drinking water—apply to the State Board of Health, Hartford.
- Milk for bacterial content—apply to the Dairy Commissioner, Hartford.
- Sick or dead poultry should be sent to Poultry Department, Storrs Experiment Station, Storrs, Conn.

PROJECTS ACTIVE DURING THE YEAR

ANALYTICAL CHEMISTRY

Dr. E. M. Bailey in charge

1. Inspection of Fertilizers.
2. Inspection of Feeding Stuffs.
3. Inspection of Foods and Drugs.
4. Calibration of Babcock Glassware.
5. Inspection of Insecticides and Fungicides.
6. Studies on Methods.
7. Analysis of Diabetic Foods.
8. Analysis of Check Samples—Cottonseed Meal and Mixed Fertilizers.
9. A Study of the chemical changes in Standard Spray Mixtures. (See also Entomology No. 14.)

BIOCHEMISTRY

*Dr. T. B. Osborne in charge**(In collaboration with Dr. L. B. Mendel, Yale University.)*

1. A Study of the Relation of Diet to the Development of Bone.
2. The Effect of High Protein on the Kidney and Other Organs.
3. Experiments on the Influence of Diet on Fertility.
4. The Relation of Diet to the Rate of Growth.
5. Further Study of the Part Played by Individual Amino-Acids in Nutrition.
6. The Investigation of the Chemical Constituents of Green Leaves.

BOTANY

Dr. G. P. Clinton in charge

1. The Effect of Fertilizers, Especially Nitrate of Soda, on the Growth, Yield, Longevity and "Yellows" of Peaches.
2. The Nature and Cause of Mosaic Disease of Plants.
4. The Rusts of Connecticut.
5. Plant Disease Survey of Conn.
6. *Thielavia Basicola*; a Study of the Perfect Stage.
7. A Study of Pythiums.
8. Comparison of Spraying and Dusting on Apples and Peaches, Especially to Try New Dusts. (See Entomology No. 3.)
9. Control of Celery Blights with Sprays and Dusts.
13. Peach "Yellows."
15. Chestnut Blight—virulence studies.
16. White Pine Blister Rust. (Certain phases of the life History.)
21. Influence of Bud Inheritance on Yield of Peaches.
22. Influence of Root Grafts on Scions of Apples.

ENTOMOLOGY

Dr. W. E. Britton in charge

1. The Life History, Habits and Control of the Plum Curculio on Apple.
3. Comparisons of Spraying and Dusting on Apples and Peaches, Especially to Try New Dusts. (See also Botany No. 8.)

6. Control of Foul Brood of Bees.
7. A Study of the Life History and Methods of Control of the Asiatic Beetle, *Anomala orientalis*.
9. Insect Survey of Connecticut.
14. A Study of the Chemical Changes in Standard Spray Mixtures. (See also Chemistry No. 9.)
15. Bionomics of the Birch Leaf Skeletonizer, *Bucculatrix canadensisella*.
16. Experiments with Baits Attractive to the Cabbage Maggot Fly.
17. Life History and Methods of Controlling the Oriental Peach Moth, *Laspeyresia molesta*.
18. Life History of Imported Current Worm.
20. Life History, Habits and Control of the Imported Birch Leaf-Miner, *Fenusa pumila* Klug.
21. Life History and Control of the Spinach Leaf-Miner.
22. Insects Infesting Nursery Stock in Connecticut.

Control Projects

10. Inspection of Orchards and Nurseries.
11. Control of Gipsy Moth.
12. Elimination of the Mosquito Nuisance in Salt Marshes.
13. Inspection of Apiaries.
19. Control of the European Corn Borer.

FORESTRY

Mr. W. O. Filley in charge

1. Experimental Plantations on a Sandy Tract at Rainbow.
 - a. Comparison of a wide variety of conifers and hardwoods.
 - b. Methods of management for those species that have survived.
 - c. Studies on growth and habits of the several species.
2. Effect of Thinning in White Pine (At Shaker Station)—Three Grades of Thinning.
3. Effect of Thinning in Hardwoods (At Quassapaug Lake).
8. Studies of Forest Plantations (State-wide).
 - a. Comparative growth of various species.
 - b. Reasons for success or failure.
 - c. Soil and other site factors necessary for success of each species.
10. Distribution and Growth of Forest Trees as Influenced by Soil Conditions.
 - a. To determine the basic factors inherent in forest soils which influence the natural growth and distribution of trees.
 - b. To study the natural distribution of tree species and forest types with reference to soil.
 - c. To study the growth and yield of forests as influenced by soil factors.
11. Coniferous Seed Bed Study to Determine:
 - a. The value of fertilizers in seed beds.
 - b. The value of different amounts of seed.
 - c. The value of dusts and sprays in preventing damping off.

Control Project

7. Control of White Pine Blister Rust.

GENETICS

Dr. D. F. Jones in charge

1. A Genetic Study of Hereditary Characters in Corn Involving Their Linkage Relations and Variability.
2. The Effects of Inbreeding and Crossing upon Corn in Relation to Vigor, Rate of Growth, Productiveness and Variability.
3. Methods for the Improvement of Naturally Cross-Fertilized Plants by Selection in Self-Fertilized Lines with Particular Attention to the Monoecious, Wind-Pollinated Corn Plant.
4. Methods for the Improvement of Naturally Self-Fertilized Plants with Particular Attention to Tobacco.

SOILS

Mr. M. F. Morgan in charge

1. What Soil Type Characteristics are Factors in Determining Land Utilization.
2. Experiments in Lawn Fertilization.

TOBACCO SUB-STATION AT WINDSOR

Dr. P. J. Anderson in charge

1. Fertilizer Tests.
 - a. Sources of Nitrogen.
 - b. Rates and Sources of Phosphoric Acid.
 - c. Sources of Potash.
 - d. Fractional Applications Compared with Broadcast at Different Rates.
 - e. Miscellaneous Materials.
2. Strain Trials of Havana Seed and Broadleaf (Plant Breeding).
3. Improvement of Cuban Shade-grown—(Plant Breeding).
4. Effect of Various Cover Crops on Yield, Quality and Disease.
5. Tobacco Sick Soils (Brown Root Rot) with U. S. D. A.
6. Black Root Rot—Relation of Soil Reaction.
7. Trials with Cigarette and other Types of Tobacco.

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All of which is respectfully submitted,

WILLIAM L. SLATE, JR.,

Director.

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